

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Observations of Comets and Asteroids

PERFORMING ORGANIZATION

Astronomy Program
University of Maryland
College Park, MD 20742

INVESTIGATOR'S NAME

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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

a. Strategy We use all available ground-based observational techniques to study the chemical and physical properties of the small bodies of the solar system, primarily comets and secondarily asteroids. The ultimate goal is to use these bodies to understand the formation and evolution of the solar system.

b. Accomplishments 1987-1988. (i) continued the analysis of ccd images of comet P/Halley. This included a major revision of our paper on the periodicities of CN jets in Halley showing that their periodicity is 7.3 days, not 2.2 days. It also included an analysis of the continuum images which showed that the dust in jets is much redder than in the "ambient" coma. Calculations with Mie theory suggest that the particles which must be "added" in the jets to make them red are exactly those particles that show the strongest effects of radiation pressure. Much effort was expended devising methods to estimate the level of sky background of the many images in which the comet extends to the edge of the chip. Profile-fitting to determine the asymptote seems to work but is very sensitive to the portion of the comet over which the image is fit. (ii) Examined images of comet Wilson taken over many months in 1987. Wilson, a dynamically new comet, shows none of the short-term variability or jet structure (either dusty jets or jets of radicals seen in Halley. This is presumably due to the lack of a mantle or the nucleus. (iii) Developed median-imaging of sky as a technique for removing residual flat-fielding errors in ccd images. (iv) Developed a Monte Carlo model and a convolution model for studying temporal variability of gaseous daughter products. (v) Wrote several review papers. (vi) Began reduction of a Pluto-Charon mutual event observed with ccd from Perth.

c Plan for Next Year (i) Archiving all ccd data with IHW. (ii) Further reduction of ccd images of Halley and Wilson beginning with careful subtraction of continuum from emission-band images. (iii) Complete model for temporal variability and apply to Halley to determine lifetimes of parents. (iv) Continue ccd observations of comets.

d. Publications 1987-1988

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A'Hearn, M.F. 1988 Observations of Cometary Nuclei in Ann. Rev. Earth, Planet. Sci, 16, 273-293.

Birch, P.F, Bowers, C.L, and A'Hearn, M.F., 1987, The 1987 May 28th Inferior Conjunction of the Pluto/Charon System. The Australian Physicist 24, 222-223.

Hoban S., A'Hearn, M.F. and Birch, P.V., 1988 Variations in the Size Distribution of Dust in P/Halley, Manuscript being edited for submission to Icarus.

*Hoban S., Samarasinha, N.H., A'Hearn, M.F. and Klinglesmith, D.A. 1988, An Investigation into Periodicities in the Morphology of CN Jets in Comet P/Halley, Astron. Astrophys. 195, 331-337.

*Millis, R.L., A'Hearn, M.F., and Campins, H., 1988, An Investigation of the Nucleus and Coma of Comet Arend-Rigaux, Ap.J. 324, 1194-1209.

*Millis, R. L. ... A'Hearn, M.F. Schnuur, R.G. ... 1987, The Size, Shape, Density and Albedo of Ceres from its Occultation of BD+8°47', Icarus 72, 507-518.

Weissman, P.R., A'Hearn, M.F., McFadden, L.A. and Rickman, H., 1988, Evolution of Comets into Asteroids, to appear in "Asteroids", book based on "Asteroids II", meeting in Tucson, April 1988.

* These items listed as submitted on last year's T43 .
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